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FOSSIL BONES OF BIRDS AND MAMMALS FROM GROTTO PIETRO TAMPONI AND GRIVE-ST. ALBAN.

BY R. W. SHUFELDT, M. D.

For some time past the writer has had in his possession a small collection of fossil bones that were kindly submitted to him by Mr. Jno. Eyerman, of Easton, Pennsylvania, to whose cabinet they belong.

These fossil bones are from birds and mammals, and were obtained from two very different localities, the smaller lot of the two having been collected at the Grotto Pietro Tamponi, and the remainder of them at Grive-St. Alban, in France. In his letter of transmittal, Mr. Eyerman invites my attention to the fact that the celebrated locality, Grive-St. Alban, " is situated in the department of Isère, France, the deposits belonging to the upper division of the Middle Miocene. European geologists have arranged the Middle Miocene into two divisions, of which the upper is distributed principally in isolated patches throughout France, although these deposits are also found in Germany and in the Vienna Basin."

" Grive-St. Alban is justly famous for the large number and great variety of mammalian remains found in its beds, of which we have *Listriodon*, *Hyotherium*, *Palœomeryx*, *Micromeryx*, *Dicroceros* of the Artiodactyla, as well as the earliest antelope, *Protragoceros*. Of the Perissodactyla there are the hornless rhinoceros, *Aceratherium*, *Chalicotherium*. Of the Proboscidea there is the *Mastodon augustidens*. The Rodentia is represented by *Lagomys*, *Myoxus*, *Sciurus*, *Chalicomys* and the large Dormouse, *Cricetodon*. The Carnivora by *Viverra*, *Lutra*, *Dinocyon*; the sabre-tooth tiger, *Machaerodus*; the mongoose, *Herpestes*, and the disputed genus *Haplogale* of Sclosser. The Insectivores by *Plesiosorex*, *Erinaceus* and *Talpa*, and, finally, the fossil Gibbon, *Hylobates*."

In the second locality, or that of Tavolara, we find the "Grotto Pietro Tamponi, consisting of several chambers, and situated on the small Island of Tavolara, in the Gulf of Terranova, a few miles off the northeast coast of Sardinia. The upper chamber of this grotto contains numerous remains of the rodent *Lagomys sardus* (Giebel's variety *corsicanus*). The lower chamber has produced the avian remains."

Taking these specimens by their original numbers, I find them to be as represented in the following list:—

1. The left *carpo-metacarpus* of a bird.
2. The left *radius* of a bird.
3. The right *tibio-tarsus* of a bird.
4. The right *ulna* of a bird.
5. Right and left *femora;* birds.
6. Right and left *humeri;* birds.
7. The right *femur* of a mammal.
8. The right *coracoid* of a bird.
9. The right *tibio-tarsus* of a bird.
10. The right *tarso-metatarsus* of a bird; also the right *ulna* of a mammal.
11. The right *tibio-tarsus* of a bird.
12. Portion of the upper third of the right *tibio-tarsus* of a bird.
13. The distal moiety of the left *tarso-metatarsus* of a bird.
14. The proximal moiety of the *ungual phalanx* of a small mammal (carnivore).
15. The proximal third of the left *carpo-metacarpus* of a bird.
16. The distal extremity of the left *tarso-metatarsus* of a bird.
17. The left *humerus* of a bird.
18. The upper two-thirds of the right *tarso-metatarsus* of a bird (in two fragments).
19. The right *carpo-metacarpus* of a bird (not perfect).
20. Two *carpo-metacarpi* of birds, both from right side, perfect and very small.
21. The right *humerus* of a bird.
22. The right *humerus* of a bird.
23. The proximal moiety of the right *humerus* of a bird.
24. The proximal moiety of the left *tarso-metatarsus* of a bird.
25. The left *humerus* of a bird.
26. The left *ulna* of a bird.
27. The distal extremity of the left (?) *femur* of a mammal.
28. Not received.
29. Not received.
30. The distal extremity of the right *tarso-metatarsus* of a bird (two fragments).
31. The distal extremity of the left *tarso-metatarsus* of a bird (in two fragments).

These specimens are all from adult individuals of the various species they represent; they are, furthermore, thoroughly fossilized; free from any matrix, save in a few instances where a thin layer of a dark-colored incrustation spreads over the ends of some of the long and other bones. They are very light in color, and, upon the whole, quite perfect. Some are thoroughly so, as, for example, Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 20, others exhibit a little chipping at the extremities, or have other slight imperfections, as, for example, Nos. 11, 17, 19, 21, 22, 25 and 26; while, finally, the balance are more or less fragmentary, as set forth in the above list.

No. 7 is a femur that apparently belonged to a medium-sized rodent, but as I have not the proper material wherewith to compare it, it is impossible for me to identify the species. It has a total length of 4.9 centimeters, and presents the usual characters seen in a small rodent's femur, as that, for example, of one of the Sciuridæ, or some of their near allies.

The *ulna* in lot No. 10, and the end of the *femur* in No. 27, also belong to small mammals, but, from lack of material, I am unable to identify them. The first-mentioned specimen has a length of 4 centimeters, while the last is fragmentary, and I take it to be a mammal from the fact that no fibular notch exists in the posterior aspect of the external condyle—a common avian character.

A study of specimens Nos. 1, 2, 3, 4, 5, 6, 8, 9, the tarso-metatarsus of lot No. 10 and No. 11, convinced me that they had one and all belonged to species of Shearwater (*Puffinus*). This conviction was arrived at after comparing the bones with those of a skeleton of *Puffinus borealis*,[1] and with the figures and descriptions given us by Professor Alf. Milne-Edwards in his *Recherches sur les Oiseaux Fossiles de la France.*[2] Furthermore, the tibio-tarsus No. 3 agreed exactly in length and in characters with the specimen No. 9, while in the case of the femora in lot No. 5, and the humeri in lot No. 6, although they agreed in characters, differed in either case, somewhat in length. This, however, amounted to but very little; for example, one of the femora measured 4.0 cms. in length, and the other 3.9 cms. in length, whereas, in the case of the humeri, this difference is a little greater, one having a length of 7.9 cms. and the other only 7.5 cms.

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[1] Mounted Coll. U. S. Nat. Mus., No. 17,772.

[2] Planches 49–53 incl. Atlas I, where the bones of *Puffinus cinereus* are figured. and in Texte I, p. 301, *et seq.* where they are, with others, described.

Disregarding the cnemial projection or process, and measuring the length of the bone from the summit to the lowermost point of the outer condyle, we found that the tibio-tarsus of No. 3 has a length of 6.7 cms., while a similar measurement of the tibio-tarsus No. 11 is found to be 7.4 cms. In this latter specimen the cnemial process has been broken off and lost. So great a distance as this leads me to believe that this longer bone belonged to a different species of *Puffinus*, and that the tarso-metatarsus, marked No. 10, probably belonged to the same species. Indeed, I believe that the bones Nos. 10 and 11 belonged to the same individual, inasmuch as they articulate perfectly when brought together.

So far as I have been able to discover, there have been but few remains of fossil bones of the genus *Puffinus* described. Two of these are to be found in M. Milne-Edwards's work (*Oiseaux Fossiles de la France*, T. II), where, upon page 588, he says, "Le *Puffinus conradi* provient du Miocéne du Maryland; ses dimensions se rapprochaient de celles du Puffin cendré (*Puffinus cinereus* Gmelin), de la côte occidentale d'Amérique;" and again, on page 572, in speaking of *Puffinus arvernensis* (rare à Langy), he says, "Cette espèce, ayant été découverte depuis la publication du chapitre relatif aux oiseaux fossiles de cette famille, sera décrite et figurée dans un travail supplémentaire." Upon comparing the bones before me with the figures of the corresponding ones of *Puffinus cinereus* as given us by Milne-Edwards, I find that the latter species is very considerably larger than were either of the former, so that bones Nos. 10 and 11 did not belong to a specimen of *Puffinus conradi*. In order to make certain that M. Milne-Edwards had not described *Puffinus arvernensis*, I wrote him concerning that species, and received the following reply, accompanied by the drawings he mentions (Plate XXIV, figs. 1 and 2), for both of which distinguished favors my most sincere thanks are here tendered.

MUSEUM D'HISTOIRE NATURELLE. DIRECTION.

9 Juillet 1896.

Cher Monsieur:

Je m' empresse de vous envoyer un dessin du tarso-métatarsien du *Puffinus arvernensis* de St. Gerand le Puy. Je dois decrire cette espèce dans un supplément à mon Oiseaux fossiles mais vous pouvez faire tel usage qui vous conviendrai du dessin et le publier si vous le desirez; il est fait de grandeur naturelle.

Croyez, cher Monsieur, à mon sentiments tres distingués.

A. MILNE-EDWARDS.

Unfortunately, among the bones of the smaller species of *Puffinus* before me there occurred no specimen of a tarso-metatarsus, so that I am unable to say whether they belong to the species described by Professor Milne-Edwards as *Puffinus arvernensis,* or not. Nevertheless, upon measuring across the condyles at their lower aspects, and taking a similar transverse diameter of the summit of the tarso-metatarsus in Professor Milne-Edwards' drawing, it becomes evident that *Puffinus arvernensis* must have had a tibio-tarsus quite like the one shown in figure 9 of the plate. In other words, I believe the fossil bones of the smaller species of *Puffinus* in Mr. Eyerman's collection very probably belonged to one or two individuals of the type referred to by Professor Milne-Edwards as *P. arvernensis,* which species is based upon the tarso-metatarsus shown in figures 1 and 2. In any event, there is so much likelihood of this being the case, that I do not, at present, feel justified in describing these bones as having belonged to a species unknown to science up to the present writing. These bones have all the characters of the corresponding ones as found in the skeleton of the Shearwater (*P. borealis*) before me, with the exception of some differences in the tibio-tarsi and the humeri. In the former the cnemial crests are much produced upward, as in *Puffinus cinereus,* and call to mind this bone in the Grebes; while in the latter, there is a very remarkable flattening of the bone in the same plane in which the radial crest lies. This flattening is well-shown in figure 7 of the plate.

As has already been said above, the tarso-metatarsus in lot No. 10 and the tibio-tarsus No. 11, undoubtedly belonged to a larger species of *Puffinus,* and one probably smaller than the *P. conradi* of Marsh: in fact, to a form having a size between *P. arvernensis* and *P. conradi* and hitherto undescribed. Therefore, I propose the following for this species :—

Puffinus eyermani n. sp.

Based on a *tibio-tarsus* and a *tarso-metatarsus,* both of the right side. They belonged to adult individuals, or, what is more likely, to the one and same individual, as the bones articulate together perfectly. Disregarding the fractured remains of the cnemial crest of the tibio-tarsus, and measuring between summit and lowest point of condyle, this bone has a length of 7.4 cms, while the tarso-metatarsus is 5.2 cms. long. They both present characters agreeing in the main with the corresponding ones in *Puffinus cinereus* Gmel.

The shaft of the tibio-tarsus is somewhat flattened or compressed in the antero-posterior direction, and its distal third, to some degree, curves gently mesiad. The fibular ridge is well-marked, and occupies rather more than the upper third of the external border of the bone. Distally, we find the usual osseous bridgelet spanning the deep tendinal groove upon the anterior aspect. In the intercondylar space, posteriorly, there is a faint indication of a median longitudinal ridge, that is also visible in *Puffinus borealis* (fig. 8). The *tarso-metatarsus* (Plate XXIV, figs. 3 and 4) is straight, and is grooved for tendons the entire length of its anterior face, and faintly so upon its posterior aspect. Distally the mid-trochlear process is placed the lowest on the end of the shaft, while the internal one is the highest, and is directed backward and slightly inward. The hypotarsus is well-developed and is twice vertically pierced for the passage of tendons, while faint groovings also exist upon its postero-external surface. In the fossa at the proximal end of the bone, just below the summit, are two small foramina piercing the shaft from before backward. The sides of the shaft are flat.

These bones were discovered in the Grotto Pietro Tamponi, Tavolara, an island in the Gulf of Terranova, a few miles off the northeast coast of Sardinia.

The species is extinct, and it gives me pleasure to name it in honor of the well-known paleontologist, John Eyerman, Esq., of Easton, Pennsylvania, in whose collection the specimens, at the present writing, belong.

The specimen marked No. 12, represents the upper part of the right tibio-tarsus of a bird of some considerable size (see fig. 1 of the text). Its procnemial process is slightly broken away above, and the free margin of the summit of the bone behind is also chipped away.

We have in the National Museum a great number of specimens of the fossil bones of birds received several years ago from Professor Alf. Milne-Edwards, and among these, numerous examples of the long bones of *Palæolodus crassipes, P. ambiguus* and others of the genus, but this bone did not belong to a *Palæolodus.* Upon comparing with such material as I had of *Pelecanus gracilis,* it was quickly seen that it never came from a Pelican, and the fact was further confirmed by carefully comparing it with the tibio-tarsi of numerous species of existing forms of that group. In short it has been compared by me with every figure of the larger birds where the tibio tarsus has been figured, in all the works at hand, as well as with the tibio-tarsi of representative groups of existing types.

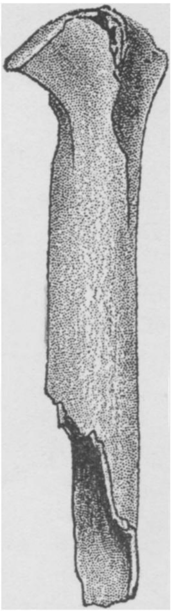

FIG. 1. Anterior aspect of the tibio tarsus of *Tantalus milne-edwardsii*, being the upper part from the right leg. Natural size; drawn by the author.[3]

By differential diagnosis, I am satisfied that its owner was a *Tantalus*, and that too, very near *Tantalus loculator*. Moreover it was a *Tantalus* of almost precisely the same size as *T. loculator*, and its tibio-tarsus presents characters agreeing very closely with that species. The agreement is so close that it would appear unnecessary to remove it from that genus, I therefore propose the following:

Tantalus milne-edwardsii n. sp.

Based upon the upper part of the *right tibio-tarsus* (nearly complete). Characters as in *Tantalus loculator*, to which latter species, the present one must have been closely related. This species I name in honor of the very distinguished French savant Professor Alphonse Milne Edwards, who not only has assisted me in the present paper, but to whom modern science owes so much in so many departments.

The specimen was collected at Grive-St. Alban (Isère), and it is at this writing in the collection of Mr. Jno. Eyerman, of Easton, Pennsylvania, U. S. A.[4]

Specimen No. 13, (the lower half of a bird's tarso-metatarsus, from the right pelvic limb), evidently belonged to some adult, medium sized species of a falconine form, probably now extinct. As I have not the proper material in sufficient quantity to compare this specimen with, I do not feel warranted in naming it.

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[3] After this drawing was made, two other small fragments were found that, when placed in situ, simply completed the distal broken part of this fragment.

[4] In comparing this bone, the following works and the plates and figures thereto were also examined. Cuvier: Recherches sur les ossements fossiles, t. III, p. 327, pl. LXXIII, fig. 14 (*Ibis*); P. Gervais: Oiseaux fossiles, thèse, 1844, p. 39; *Idem*, Jour. l. Institut., 1844, p. 293; *Idem*, Zoologie et Palæontologie françaises, 1st edit., p. 230, pl. XLIX, figs. 2, 3, p. L, fig. 1 (*Numenius gypsorum*); 2d ed., 1859, p. 410; Giebel: Fauna der Vorwelt, 1847, t. II, p. 28 (*Tantalus fossilis*). I think the specimen here alluded to is either a *Numenius* or an *Ibis*, surely not a *Tantalus*.

For specimen No. 14, see list above; too fragmentary for correct identification. To be named with certainty, No. 15 is also too fragmentary; while the remarks about specimen No. 15, apply with equal truth to No. 16, though this last has hardly anything beyond the trochlear processes, the distal part of the shaft having been broken off, but a few millimeters above the usual foramen found in this locality.

Specimen No. 17 is a very perfect one, being the *left humerus* of an adult Partridge, *Palæortyx brevipes* of Milne-Edwards.[5] It demands no special description.

In specimen No. 18, we have the fragments of the upper two-thirds of the right tarso-metatarsus, (probably) of some small passerine bird, which my meagre material for comparison will not admit of my identifying. On this bone the *hypotarsus* is short, being composed of two lateral portions enclosing a tendinal foraminal canal between them. Both of these lateral portions are distinctly grooved in the vertical direction, upon their posterior aspects, by tendinal channels. To identify such a minute, fragmentary specimen as this, one should have before him for comparison the skeletons of a representative series of the small birds of France in its existing avifauna, as well as access to such fossil forms as have been discovered or described up to date. To appreciate the difficulty of diagnosis of this nature one has but to make the trial to distinguish the *complete* skeleton of any one of our American Warblers from those of its near allies in other genera, and my meaning will be made clear. How much more difficult is it then to name, with any hope whatever of being near the truth, the bits of bones of birds of no greater size that existed in a former geologic age of the earth. With skulls, sterna, pelvis and *perfect bones* all absent this really becomes impossible—absolutely so in the absence of the material above indicated.

These remarks apply with equal truth to specimens Nos. 19–23 inclusive; the small pair of carpo-metacarpi (No. 20) in this series are the smallest fossil bones of this part of the skeleton I have ever seen; either one of them is as small as the *unidentified* specimen of this bone in Milne-Edwards' great work, and figured on Plate 155, (Atlas 2, fig. 11); they are, however, from a different species.

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[5] See *Recherches sur les Oiseaux fossiles de la France*, Atlas 2, Plate 130, fig. 13.

The fragment of bone in specimen No. 24 is from an Owl—the extinct *Bubo arvernensis* of Milne-Edwards (see *Oiseaux fossiles*, Atlas 2, Plate 192, figs. 11 and 15).

No. 25 is the *humerus* of some medium-sized bird equal to about that of *Tringa gracilis* of Milne-Edwards, but it did not belong to that species. It is non-pneumatic, with characters in many respects agreeing with the humeri of small water birds, as plovers or sand pipers, but it lacks the *epicondyloid process* possessed by this bone in both Gulls and *Tringæ*. It has a length of 3.5 centimeters. I do not care to pronounce upon it before comparing with fuller material.

No. 26, a small bird's ulna, but 2.1 centimeters long and with a very sharp olecranon process, comes in the same category as Nos. 19–23, (see remarks above). Its shaft is distinctly marked by 6 papillæ for the quill-butts of the secondary feathers, they being about 2 mm. apart.

The bones in Nos. 30 and 31 are the distal ends of the tarso-metatarsi of small Gulls of the genus *Larus*. The first I take to have belonged to an individual of the extinct species *Larus totanoides*[6] aud the other to the somewhat smaller species *Larus elegans* both of Milne-Edwards.[7] I am the more convinced of this, inasmuch as I have compared them, at least in the case of *Larus elegans*, with a number of the fossil tarso-metatarsi of that extinct form in the palæontological collections of the U. S. National Museum, and the agreement is altogether too close to admit of any doubt.

Explanation of Plate XXIV.

Fig. 1. Left tarso-metatarsus of *Puffinus arvernensis*, anterior aspect, natural size. From a drawing by Prof. Alphonse Milne-Edwards.

Fig. 2. Left tarso-metatarsus of *Puffinus arvernensis*. Same bone as shown in figure 1. Natural size, and viewed upon its externo-lateral aspect.

Fig. 3. Right tarso-metatarsus of *Puffinus eyermani*, anterior aspect, natural size. Drawn by the author.

Fig. 4. Right tarso-metatarsus of *Puffinus eyermani*. Same bone as shown in figure 3. Natural size and viewed upon its externo-lateral aspect. Drawn by the author.

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[6] *Oiseaux fossiles*, Atlas 1, Planche 57, fig. 12.

[7] *Loc. cit.*, Planche 56, fig. 11.

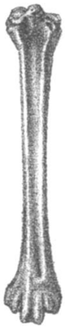
Fig. 5. Right coracoid of *Puffinus arvernensis* (?), anterior aspect, natural size.

Fig. 6. Anconal aspect of the left humerus of *Puffinus arvernensis* (?), natural size.

Fig. 7. Ulnar surface of the left humerus of *Puffinus arvernensis* (?), natural size.

Fig. 8. Right tibio-tarsus of *Puffinus eyermani*, natural size and viewed upon its anterior aspect. Cnemial process restored in dotted line.

Fig. 9. Right tibio-tarsus of *Puffinus arvernensis* (?), natural size, and viewed upon its anterior aspect. Figures 5–9 inclusive, drawn by the author.



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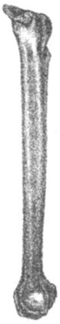

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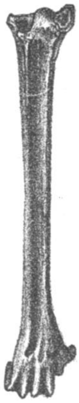

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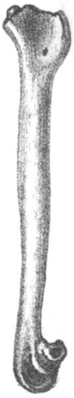

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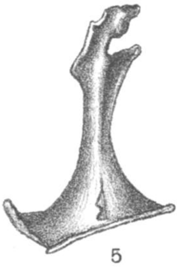

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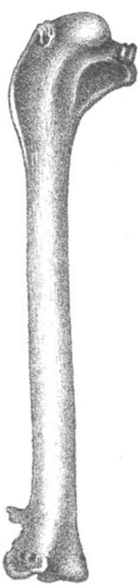

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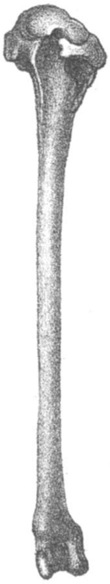

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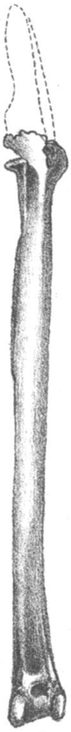

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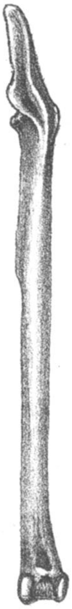

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R. W. Shufeldt, ad. Nat. Del.

SHUFELDT. FOSSIL MAMMALS AND BIRDS.